GAS JOURNAL, MAY 8, 1946

VOL. 247 98th YEAR No. 4329

THE GAS INDUSTRY AND FUEL

IT is well that from time to time we should be reminded that the Gas Industry is part of a greater whole. Those who live and work in any industry are prone to see events through spectacles coloured with reflections from their daily interests. Enthusiasm is highly praiseworthy. Enthusiasm, however, must be tempered with wider knowledge. The Paper presented to the Southern Association by Dr. Foxwell, which is given in our columns to-day, had the merit of looking at the Gas Industry and its future in the light of the whole picture of fuel technology as it affects this country. It is in this spirit that we shall appraise it.

In his spoken word, more perhaps than in the written word, Dr. Foxwell based the national fuel policy on coal conservation. That basis demands examination, because if it be conceded, much follows as a consequence, whereas if it be not conceded there is much in his basic assumptions which must and will be called in question. What is our fuel position? There need be no qualms about accepting the basic fact that our whole industrial future, our prosperity (in so far as we enjoy any prosperity to-day), and our national power are based on coal at the present time. We need only remind ourselves that before the start of the industrial revolution our population was predominantly rural and numbered no more than 5½ millions, which was about the maximum number that had ever existed in this country. As a result of the industrial revolution the population rose to 45,000,000—not because we had advanced our agricultural methods sufficiently to feed that number of persons, but because we could import food and luxuries freely as the result of our capacity to export. All this expansion was based on coal. Coal was used for the creation of power through steam, through the gas engine, through electricity. Coal was the basis of the iron and steel industry. Steam was the basis of transport until comparatively recent times. Without coal nothing was possible; with coal it seemed during the Victorian period that everything was possible. If to-morrow we were deprived of coal, what population could these islands support? One guess is as good as another, but our estimate is about 10 millions, with a possibility of 15 millions. Where would then be our vaunted power?

It is not necessary to be deprived of coal for this to happen. It would be sufficient if our coal became so expensive that our industries could no longer compete in the markets of the world. Let it not be forgotten that if coal is expensive, the cost of fuel in the household is expensive; wages consequently will tend to rise to keep pace with the cost of living. Both indirectly and directly, dear coal hits the manufacturer. This country rose to its present position on cheap coal; perhaps the coal was sometimes too cheap and it was wasted, but the fact remains that cheap coal has been the foundation of our past success. To-day coal is no longer cheap. A prominent steel magnate has recently said: "The average of coal delivered to steel-works in America is approximately 20s. a ton as compared with 40s. a ton in this country. This item alone, therefore, at the present time accounts for £2 advantage to our American friends in the cost of making a ton of steel." Nor let it be forgotten that, according to all present indications, as shown in official Ministry of Fuel Publications, the reserves of British coal will be virtually exhausted within about 150 years. That is a very short time. Just 150 years ago the Gas Industry was starting through the early efforts of Murdoch. Within that span of time ahead the Gas Industry may cease by reason of the exhaustion of its raw material. We can hardly doubt that it is imperative to use coal to the best advantage in this country, that waste of coal must on no account be permitted, that, in short, coal conservation and the use of the coal we possess with the highest efficiency must be at the forefront of British fuel policy.

It may be argued that 150 years is quite a long time, and that the march of science will disclose other sources of heat and power within that period. The answer to this is first that nothing is yet in sight that will replace coal. Atomic energy seems as likely as anything, but optimists who declare that it is just round the corner may well find that the forces of nature are too strong for them. Dr. Foxwell appeared to suggest that in future there may be a case for combining the gas and electrical industries so that each may be used to the best effect. In treating these two industries from the angle of British fuel policy, the Author no doubt had no intention of playing one off against the other. The plain fact is that both industries are servants of the public. Both provide the means whereby the nation—in home and factory—can obtain heat, light, and power.

If, then, this nation must, for the time being at any rate, base its fuel policy on coal conservation and the efficient use of fuel, there is no possible case, as Dr. Foxwell pointed out, for the use of electricity for domestic heating. The efficiency from coal to useful heat *via* electricity is less than that ruling in the inefficient coal fire. We should quite cheerfully agree that there are uses to which gas is now put in competition with electricity for which gas is by comparison less suitable. If nationalization comes to pass it may have one major advantage—namely, that it may permit gas and electricity (and all other fuels, too) to be used to the best technical effect irrespective of what the salesmen may say. Competition is a good thing, and it cannot be denied that competition between gas and electricity has stimulated both these industries to achieve heights of efficiency and of service to the community that would not have been achieved otherwise. Stimulus, it is to be hoped, will not be lost under nationalization.

Looking ahead, perhaps a time may come when some other form of energy may be able to compete with coal. When that time comes it may well be that the approaching exhaustion of our coal reserves will be such that we should conserve them for the production of metallurgical coke and of the raw materials for our manufacturing industries. If the gas and electrical industries are still in violent competition at that time, grave harm may be done through a mistaken attempt to preserve the existence of one or the other. With unified control, working in close collaboration with the Coal Board, the policy of using coal for the right purpose and leaving the new source of energy (whatever it may be) to provide heat, light, and power would be very much more likely to be adopted.

All this is looking a long way ahead; it is only speculation. In the meantime the Gas Industry has a most important part to play in the fuel economy of the nation. That part has been laid down in Dr. Foxwell's Paper and we are not disposed to quarrel with his picture, nor indeed was anyone disposed to question it in the discussion at the meeting. There was a general demand that considerable publicity should be given to the views he expressed, since they are not so generally recognized as they should be.

INDUSTRY AND THE HOME

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We have no criticism of the way in which these centres work. The fact is that with increasing coal prices, with an increased burden of fuel cost on industry, it is the obvious task of those with special knowledge to lighten the burden upon our manufacturers. The efficient use of fuel is only one of the ways in which that can be done. The opportunities for better

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fuel utilization arise with every type of fuel, but the way to reduced costs lies more through the refined fuels than through raw coal, and not entirely through increased thermal efficiency. Coke we class in this connexion as a refined fuel. Let the Industrial Gas Centres continue, and let their work be extended so that all users of gas and coke shall have available a highly efficient service of specialists to guide their fuel utilization and to keep it up to date. The Ministry of Fuel and Power has made a praiseworthy attempt to educate the fuel user. That attempt is proceeding, but valuable as it is, there is much work to be done by the real specialists in the subject which cannot be done by the engineer with a top-dressing of fuel techology. The Gas Industry must not only provide fuels. It must provide technical advisory services on a wider scale than ever before.

So we come to the home. That is where the immediate task of the Gas Industry appears to lie. We quote three passages from the report of the Fuel and Power Advisory Council on this important subject—three passages that fully confirm the deductions made by Dr. Foxwell in a Paper that was obviously written before that report had been published. *Passage No.* 1: "In our view we cannot afford to maintain our low standards of heating; we cannot afford to continue to depress and destroy the life of our cities by smoke pollution; we cannot afford to waste our limited national coal reserves." *Passage No.* 2: "The coal fire is sociable and pleasant; but it involves dirt and drudgery for the housewife; it wastes millions of tons of coal each year, and is the chief sinner in rendering our cities unfit for human habitation by its smoke." *Passage No.* 3: "It is of fundamental importance entirely to replace bituminous coal for use in the individual small house by smokeless fuels. We recommend that it should be the policy of the Government to replace bituminous coal in all single house appliances by solid smokeless fuel as rapidly as adequate supplies can be provided at a reasonable price."

This sets the immediate future course of the Gas Industry. The need for bringing all possible forces to bear on this major problem has evidently impressed the Author with the desirability of linking to the Gas Industry the coke ovens situated at collieries. A combined carbonization industry might accomplish the task of providing all the necessary smokeless fuels within some 10 years. The Fuel and Power Advisory Council seem pessimistic in their views of what is possible in the way of provision of the necessary fuels. Everything depends, however, upon labour and materials being available at the 1938 level. There will clearly be a period before any scheme can get into its full stride, but, as Dr. E. W. Smith pointed out, there is to-day more carbonizing plant being built in the country than ever before.

Our summary of the position disclosed in Dr. Foxwell's Paper is that in the immediate future, and perhaps for the next generation or two, the Gas Industry has a great work to do and will be very busily employed.

Our Peace Effort

A new campaign will shortly be launched upon a publicity-saturated public. Its aim will be to revive in the public mind the enthusiasm it displayed during the war. The inducement to work was then governed by the realization that failure to do so would only result in elimination. To convince our workers that a similar effort is needed to retrieve our export trade and so ensure our place in the forefront of the great powers is a more difficult proposition.

We were able to learn something of the form this proposed campaign is to take at a recent Press meeting addressed by Mr. Francis Williams, Public Relations Adviser to the Prime Minister. He explained that the nine million men and women who then served the country's industrial war effort have now shrunk to less than half that number. This means that factories which have had ample labour at their disposal are now faced with fast-emptying benches. This is not all, for both among the remaining workers and among those returning from the Services there exists an attitude towards work completely different from that which existed a year or so ago. Works managers are complaining bitterly of this apathy which overhangs the industrial worker. Its cause is not difficult to find; six years of poor rations, the strain and disruption of aerial attack, anxiety for relatives, and generally changing conditions tell their own story. It is, in effect, a "hangover," a general sense of tiredness and an understandable desire to rest after a difficult journey.

The future prosperity of our country depends upon our recovering and surpassing our pre-war export trade. So changed are conditions that it will be necessary to ship 175% of the 1938 volume of exports in order to achieve the standard of living we enjoyed at that time. At present shipping is a serious problem, but here, at least, we have Mr. Williams' assurance that a speedy recovery of workable ships may be expected as the craft designed for war purposes become adapted for their peacetime work.

To realize this aim complete union is necessary between employer and employee. A considerable step towards this was taken by the series of conferences at which various Cabinet Ministers addressed gatherings of industrial workers, trade union officials, and employers. So successful were these conferences that a further series is scheduled to commence from May 22.

These, however, are not the only difficulties the Government has to face Interlinked with the necessity of placing British exports back on their feet and inducing our workers to understand the immediate needs of the country are the attendant problems of reconstruction and of maintaining a sufficient manpower in the forces to eliminate as much as possible the risk of disruption abroad. The delicate balancing and proportioning of manpower is an unenviable task calling for no little foresight and discretion. We are keenly interested in the way the Government will approach these matters and how the wheels of a new propaganda drive are set in motion.

The new campaign is to be launched on fairly orthodox lines by means of posters, broadcast discussions, and by the very potent medium of the cinema. Not only is a series of "shorts" in preparation, but a full-length film is contemplated which will explain in the fullest possible way the aims and needs of the time. We would warn Mr. Williams that it will have to be good; the public has had so much rammed down its throat in recent years that the taste is becoming too familiar. We are not suggesting that Mr. Williams will be flogging a dead horse—but originality is needed to ensure results. The campaign will no doubt do much to bring about a more satisfactory understanding and approach to the question of winning the peace, but remembering instances of red tape and industrial bottlenecks, may we suggest that the solution to these problems lies not only with the recipients of this invocation but with those who deliver it?

Housing Progress

Recent White Papers published by the Government show that 30,452 dwellings were completed in Great Britain between July 31 last year and the end of the present quarter. What is very important about these documents is the marked increase which is taking place this year in house building, an indication of which is shown in the figure of 6,217 for March over the total on February 28. The number of permanent and temporary houses under construction on March 31 was 84,257, against 64,820 on February 28. The number of permanent houses under construction by local authorities has shown an increase from 9,523 to 32,378, and the number under construction by private builders has increased from 7,000 to 20,000.

This acceleration in the building of new homes which is being accompanied by the repair of premises damaged during the war marks a field of development for the Gas Industry in competition with other forms of fuel.

Gas Consumers to Benefit

The Gas Light and Coke Company finds itself in a position to make reductions in charges estimated to be in the neighbourhood of £700,000 per annum, or about 5% of the toal gas revenue, and proposes to introduce a simple block rate as the normal method of charge for gas to all consumers instead of the present flat rate. To effect this change under existing legislation would involve entering into special contracts with every one of the million and a half consumers who wished to avail themselves of the new system, so an amending Bill has been promoted to ensure that everyone without distinction shall be eligible for the advantages of the block rate without the necessity of entering into a contract. The unanimity with which the principle of the Bill was approved at the Wharncliffe Meeting last Thursday testified to the confidence which the proprietors have in the policy of the Directors, and their readiness to endorse a change which will in effect make a present to the consumers of nearly three-quarters of a million pounds without affecting the present system of dividend authorization.

While it would have been premature to disclose particulars of the proposed concessions, it is reassuring to know that all consumers who take more than a very small quantity of gas will have the benefit

of any price reduction offered, that there will be no increase even to the very smallest consumers, and that, under existing powers, slot meter consumers are to be relieved on a sliding scale of the supplement charged for hire of meter and appliances. Under the terms of the Bill the Company will still have the right to enter into special contracts for the supply of gas for industrial or other purposes at a price per therm different from the published price or scale of prices. There is also a clause which leaves it optional to the Company to continue the existing system of charge until they decide to adopt the block rate system and, after having adopted it, to revert, either permanently or temporarily, to the existing system. It is considered desirable that the Company should have this option to enable them to meet changing conditions by applying whichever system is the most suitable for the time being.

Personal

Mr. W. L. M. O'CONNOR has been elected a Director of the Imperial Continental Gas Association.

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Mr. GEORGE J. DENBIGH, M.Sc., F.R.I.C., Manager of the Wakefield Works of Brotherton & Co., Ltd., has been appointed a Director of the Company.

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Mr. L. E. DOUGALL, who has long been associated with the gas meter industry, has been appointed to represent Messrs. A. G. Sutherland, Ltd., in London and the South-Eastern Counties.

* * *

Mr. GEOFFREY BARLOW has been appointed to the Board of Meters, Ltd. Mr. Barlow is General Manager of George Orme & Co., Atlas Meter Works, Oldham, a constituent Company of Meters, Ltd., and has spent the whole of his business career with that Company.

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Mr. H. CECIL BOOTH, F.C.G.I., M.I.C.E., Chairman of the British Vacuum Cleaner & Engineering Co., Ltd., and inventor and patentee of the vacuum cleaner, has recently had his portrait painted by the well-known artist, Mr. David Jagger. The portrait is exhibited "on the line" at the Royal Academy.

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Mr. E. H. WINCH has been appointed Deputy Engineer and Manager of the Cambridge University and Town Gas Light Company. Mr. Winch joined the staff of the Company in 1921 as a Technical Assistant, and subsequently rose to the position of Second Assistant; in 1941 he was appointed Assistant Engineer, becoming Deputy Engineer in 1945.

* * *

Mr. J. THORMAN, Engineer and Manager of Huntingdon Gas and Coke Company since 1937, has been appointed Engineer and Manager of Westgate-on-Sea Gas and Electricity Company. His successor at Huntingdon will be Mr. C. DUNCAN, who for some 30 years has been an Engineer with the British Gas Light Company at Hull. Mr. Thorman's father was until his recent retirement Deputy Chief Gas Engineer of the Gas Light and Coke Company.

* * *

On his departure to take up his appointment as Chief Draughtsman of the Exeter Gas Light and Coke Company, Mr. S. BARWELL, Assistant Constructional Engineer of the Coventry Gas Department, was the recipient of a presentation. Tribute was paid by Mr. J. E. Wakeford, Engineer and Manager, Mr. A. E. W. Attwood, Constructional Engineer, Mr. A. E. West, Mr. F. A. C. Pykett, and Mr. R. B. Watkins to his services to the Coventry undertaking.

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Mr. W. J. COUCH, F.C.I.S., Secretary of the Camborne Gas Company, is retiring after 40 years' service. Mr. E. S. BUCKLEY, Engineer and Manager of the same Company, has been appointed Engineer and General Manager of the Seaton, Axminster, and District Gas Company. He is succeeded at Camborne by Mr. W. J. BURLEY, Engineer and Manager of the Crewkerne Gas and Coke Company, who undertakes the combined duties of Engineer, Manager, and Secretary.

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Lieut.-Colonel F. J. BYWATER, M.C., who was appointed a Director of the South Metropolitan Gas Company early in the year in succession to the late Dr. E. F. Armstrong, has retired from the staff of the Company and from his office as Comptroller and District Manager. He joined the Company in 1912, first as Engineer in charge of the East Greenwich works, and then after the 1914–18 war as the Company's representative in the Newcastle organization, which was his creation, and finally as Comptroller and District Manager.

A luncheon was given in London on April 30 by the Directors of the Parkinson & Cowan Group of Companies to the senior members of the staff, to celebrate Mr. A. J. WEST's completion of 50 years' service. Mr. A. J. West is well known in the Gas Industry as a Director of the Parent Company and various subsidiaries, at the same time being Joint General Manager of the Gas Meters Division. The Chairman, Lt.-Col. H. W. Woodall, in congratulating Mr. West on his many years of service, presented him with a cheque contributed by the Directors and staff of the company.

* * *

Mr. J. R. MARTINDALE, Works Superintendent at the Canons Marsh Works of the Bristol Gas Company, has been appointed Engineer of the East Hull Gas Company in place of Mr. BERNARD STONHAM, who has been appointed an Assistant Controller in the Allied Control Commission. Mr. F. GIBSON, Assistant Secretary and Accountant to the Lowestoft Gas and Water Company, is now Cashier and Accountant at East Hull in place of Mr. H. BAILEY, who has accepted an appointment with a local firm of Chartered Accountants. Mr. K. W. HUDSON, Assistant Distribution Engineer with the Preston Gas Company, is to succeed Mr. J. H. NUTTON, who has been appointed Distribution Superintendent to the Swansea Gas Light Company.

Obituary

The death took place on April 26 of Mr. EDWARD T. CHRISTIAN, Chairman of the Peel Gas Company, Isle of Man. Mr. Christian was appointed a Director in 1883, and became Chairman in 1890, and has attended practically every meeting during his 63 years' association. He was also a Director of the Peel Water Works Company since 1888, and its Chairman for the past ten years. In 1943 Mr. and Mrs. Christian celebrated their diamond wedding. Mrs. Christian died in January last. Mr. Christian took a keen interest in public affairs, and served on the Town Board and represented the Sheading of Glenfaba in the House of Keys. He has been Captain of the Parish of German since 1918, and as such has been an outstanding figure at the Tynwald Ceremony. He also represented the Clothworkers' Company of London, which has built schools in Peel. He is survived by six daughters and one son, Edward, who is also a Director of the Gas and Water Companies.

Renfrew Extension

Following receipt of an application by Babcock & Wilcox, Ltd., for a supply of gas, a report by Mr. W. A. Currie, Engineer and Manager of the Renfrew Gas Department, stated that if the application, with others, was accepted, it would be necessary to double the output of the works by building new plant. The estimated capital expenditure entailed was £110,000. The Town Council agreed that the work be proceeded with subject to the applicants agreeing to pay a guaranteed sum per annum. At a subsequent meeting it was intimated that Babcock & Wilcox would make a survey of the actual amount they could guarantee to take, after which they would communicate with the Council.

The question of a bulk supply from Paisley was raised at a meeting of the Gas Committee when the advantages of having the present Renfrew works developed to their maximum capacity were gone into. It was anticipated that centralized manufacture would have to be considered in the early future in view of the development of the area, and the case for laying down the centralized works in Renfrew was also mentioned.

I.E.S. Convention

The first convention of the Illuminating Engineering Society will be held May 14–16. The following is the programme:

May 14.—6 p.m. Reception by the President at the Institution of Electrical Engineers. The Exhibition at the adjacent Lighting Service Bureau will be open for inspection. Popular Talks on "Lighting in Captivity" (R. A. Eshelby, 7 p.m.), "Some Light on Invasion" (Crawford Sugg, 7.30 p.m.), "Some Uses of Black Light" (H. R. Ruff, 8 p.m.), and "Conjuring with Colours" (J. S. Preston, 8.30 p.m.) will be given in the I.E.E. Lecture Theatre.

May 15.—10 a.m. Annual General Meeting, and Presentation to retiring Hon. Secretary. 10.30 a.m. Address on "Lighting During the War and After" (P. Good). 11.15 a.m. Address on "Light and Vision" (Professor H. Hartridge). 12.30 p.m. President's Luncheon to I.E.S.L. representatives. 2.30 p.m. "New Lamps for Old" (L. J. Davies). 5.30 p.m. Dinner-Dance at the Connaught Rooms.

May 16.—10 a.m. "Laboratory Technique for the Solution of Visibility Problems during the War" (W. R. Stevens and J. M. Waldram). 11.30 a.m. "The Lighting of Airports" (Dr. S. English). 2 p.m. "Daylight and Town Planning" (W. A. Allen). 3.30 p.m. "Fluorescent Lighting Practice" (W. J. Jones). 6 p.m. Informal Social Evening at Magnet House.

May 17.—Visit to the National Physical Laboratory. A river trip and a visit to Hampton Court have also been arranged.

Diary

May 9.—North of England Gas Managers' Association: Annual Meeting, Royal Station Hotel, Newcastle, 2.15 p.m.
May 9–10.—Wales and Monmouthshire Association of Gas Engineers and Managers: Annual Meeting, Prestatyn. Presidential Address, O. P. Cronshaw.
May 10.—London and Counties Coke Association: Technical Committee, Gas Industry House, 2.30 p.m.
May 10.—Yorkshire Junior Gas Association: President's Day Visit to Leeds (Bramhope, Moortown, Crossgates, &c.); assemble Gas Offices, Market Hall, Leeds, 2 p.m.
May 14.—British Gas Council: Meeting in Lord Mayor's Rooms, Hastings Street, Leicester, 11.30 a.m.
May 15.—National Federation of Gas Coke Associations: General Committee, 10 a.m., Gas Industry House.
May 15.—Solid Smokeless Fuels Federation: Executive Committee, 11.30 a.m., Dorchester Hotel, Park Lane.
May 16.—Midland Junior Gas Association: Visit to W. C. Holmes & Co., Ltd., Huddersfield, and Inspection of Sulphur Removal Plant of the Mirfield Gas Company; leaving Birmingham Gas Department Offices, 8 a.m.
May 16.—Industrial Gas Centres Committee: Parkway Hotel, Bramhope, Leeds, 10 a.m.
May 17.—London and Southern District Junior Gas Association: Annual Meeting, Gas Industry House, 6 p.m.
May 20.—London and Counties Coke Association: Finance Committee, 11 a.m.; Executive Committee, 11.30 a.m.; Central Committee, 1.30 p.m., Gas Industry House.
May 21–23.—Eastern Association of Gas Engineers and Managers: Annual General Meeting, Dorothy Restaurant, Cambridge.
May 22.—Manchester and District Junior Gas Association: Visit to the Works of West's Gas Improvement Co., Ltd., Miles Platting, followed by Paper, "The Application of Statistical Methods to the Gas Industry," by A. C. Wild, M.A. (Liverpool Gas Company).
May 23.—Lancashire and District Coke Association: Annual General Meeting, Grand Hotel, Aytoun Street, Manchester, 11.30 a.m.
May 25.—Scottish Junior Gas Association (Eastern District): Annual General Meeting, Dunfermline.
May 28.—Women's Gas Council: Annual General Meeting, Gas Industry House, 3 p.m. Speaker, Viscountess Davidson.
May 28.—Southern Association of Gas Engineers and Managers (Eastern District): County Meeting, Southend-on-Sea.
May 28.—Domestic Development Committee: Gas Industry House, 2.30 p.m.
June 1.—Midland Junior Gas Association: Ladies' Day, Cheltenham.
June 4–7.—Institution of Gas Engineers: Annual Meeting, London.

Scottish Juniors (Western District)

The annual general meeting of the Scottish Junior Gas Association (Western District) was held on April 23, in the Christian Institute, Glasgow. Office Bearers were elected as follows:

President: J. Sorley, Motherwell. *Vice-President:* D. Rowan, Neilston. *Hon. Secretary and Treasurer:* T. Stirling, Kirkintilloch. *Members of Council:* A. McFadyen (*ex officio*), L. Bain, R. Copland, C. Wilson, W. B. Wright, R. F. Bell, L. Briggs, T. Stirling, A. Facer, and L. Nichol. *Hon. Librarian:* J. H. Fulton. *Hon. Auditors:* F. Hailstones and J. C. Greig.

Fish Friers Urge Modern Firing

A recommendation that modern methods of heating should be made compulsory in the fish-frying trade and that either gas or electrical cooking equipment be installed in place of coal has been advanced by the Scottish Branch of the N.F.F.F. In a survey of post-war recommendations to the Secretary of State for Scotland, this organization makes proposals for improved standards of equipment and efficiency in the interests of health, and asks that licensing be adopted, with the elimination, at the end of five years, of friers who do not bring their premises to the desired standard of efficiency, health, and cleanliness.

An order making compulsory, where necessary, to be enforced by the appropriate authority, the fitting of modern apparatus for the extraction of steam and frying fumes from all frying equipment in present use would, it is urged, be a great step forward towards healthier conditions, the scrapping of antiquated equipment, and a higher standard of efficiency and service, beneficial to employer, employee, and customer alike. There should also be compulsory installation, where necessary, of adequate auxiliary apparatus for the extraction of vitiated air. All fish-frying establishments should have suitable refrigeration apparatus installed, within two years from an appointed date.

Chorley Gas Department has reported an increase of 24,537,000 cu.ft. in the total gas made during the year ended March 31 as compared with the previous year.

Gas Industry in Australia

The Statistical Year Book of the Gas Industry in Australia and New Zealand, 1944, just received from the National Gas Association of Australia, gives as usual a very complete survey of the working results of the majority of the undertakings. Total gas sales in Australia, estimated at 27,100 million cu.ft. for 1944, exceeded those of the previous year by 3%, and those of 1939 by 42.9%. Although there was a decline in sales to commercial and industrial users in some areas, all showed substantial increases in domestic sales. Meters in commission at the end of the year were estimated at 1,031,000, or 1.1% more than in 1943, and 14.2% more than in 1939. Coke sales were 38.9% above 1939 figures, and tar sold or treated amounted to 27,750,000 gall., which was 4.1% less than for the previous year, but 36.4% above 1939.

Australian gas undertakings carbonized 1,685,000 tons of coal in 1944. This was 4.3% more than the amount carbonized in 1943, and 39.6% above 1939 consumption. Coal stocks were reduced from approximately 117,000 tons at the beginning of the year to 94,000 tons at the close. Stocks held by gas undertakings at the beginning of 1940 totalled about 320,000 tons. The average number of persons employed by Australian gas undertakings was 8,770, which was 1.1% more than in 1943, but 10% less than in 1939.

Statistics supplied by the New Zealand undertakings show an increase in gas sales of 4.5% over the previous year.

The returns cover all the metropolitan undertakings in Australia and 87% (by gas sales) of the provincial undertakings. The New Zealand figures represent 82% of the total make of gas.

Watson House at War

In company with other sections of the Gas Industry, Watson House, focal point of research for the Gas Light & Coke Company, stepped into line at the outbreak of hostilities, and placed its facilities at the disposal of the country. Its work during the war is described in the April *Co-Partners' Magazine*, and comes as a surprise to those who thought of Watson House only as a testing and training centre for domestic purposes.

In 1940 the laboratories were approved as an official test house for the Admiralty, Air Ministry, and Ministry of Supply, and until the end of the war countless tests and experiments have been carried out. The ample workshop facilities were put to good use in training welders, and here newly-trained men were "put through their paces." Each man was required to execute an involved test job before he was passed for this work, and further tests were given when he passed from one metal to another. A large proportion of the weld-testing work for the southern counties was undertaken at Watson House, and 10,000 specimens were subjected to micro-analysis and mechanical tests.

The behaviour of aircraft instruments and bomb sights at temperatures as low as 40° below freezing-point was but one of many special investigations done on experimental equipment and materials. The design of seaplane mooring shackles, safety tests on practice bombs, and the examination of metals from captured German tanks, were among the other vital jobs undertaken. This work was carried out in the Stores Testing Section and the Research Laboratory; the other laboratories were busy with other problems. Decoy apparatus designed to imitate the glow and steam of an industrial plant and fog dispersal equipment (Fido) were chief among the many types of apparatus investigated. Experiments were also carried out during field tests on the temperatures reached in trenches under attack from flame throwers, and in the design of a gas-flame barrage to prevent the passage of tanks. The knowledge of gas volume measurements proved valuable when it became necessary to design and test various metering devices for barrage balloons, poison gases, oxygen apparatus for air crews, and measuring the effect of wind velocity on flare fuses.

War-time star lighting units, both gas and electric, received stringent tests, and advice on these matters was given to Government committees. Field tests carried out with the Transport Department determined the standardization of vehicle lighting.

Physical tests were carried out on more than 8,000 samples of various non-metallic materials, including airplane dopes, fabrics, plastics, filters, de-icing fluids, anti-misting compounds and gas detectors. Over 2,000,000 ft. of transmission tubing for Halifax bombers was tested to a stress of 4,000 lb. per sq.in., special plant being designed to overcome the difficulties caused by its extreme softness. More than 350,000 safety tests were carried out on aircraft control cables, lifting gear, safety belts for glider troops and parachute harness.

In all, 60,000 metallic samples of a wide range of alloys were machined to limits as fine as half a thousandth of an inch and were tested for mechanical characteristics; 7,000 samples were chemically analysed. The materials from which the samples were taken were to be used in the manufacture of aircraft, torpedoes, mines, tanks, and guns. As many as 350 specimens were tested in a single day.

In the Discussion on the Paper on "A Two-Fuel Industry," by Mr. A. Cole, at a meeting of the Yorkshire Junior Gas Association, reported in the "JOURNAL" of Jan. 2, Mr. Norman B. Biggs (Halifax) was erroneously referred to as Mr. H. B. Biggs. He asks us to make this correction in order to avoid possible confusion.

Committee on Patent Law

The Second Interim Report of the Committee appointed by the President of the Board of Trade to enquire into the changes necessary in the Patents and Designs Acts and the practice of the Courts in connexion therewith has now been published. The report deals mainly with the question of the abuse of monopoly rights in connexion with patents and with the trial and cost of patent actions. Copies of the Report (Cmd. 6789) are obtainable, price 9d. (by post 11d.), through any bookseller or newsagent or direct from H.M. Stationery Office, Kingsway, London, W.C. 2.

The Committee is now able to consider proposals for the amendment of the law of patents and designs outside the particular subjects dealt with in the present report. Any person who wishes to submit suggestions for consideration by the Committee should communicate with the Secretary, The Patents Committee 1944, 25, Southampton Buildings, London, W.C. 2.

Oxy-Coal Gas Flame Cutting

During the darkest days of the war, the efforts of a single "back room boy" reduced the perilous passage of war supplies across the Atlantic by one ship a month. Lieut.-Commander J. W. Hobbs, R.C.N.V.R., a Director of Oxy-Ferrolene, Leicester, who was made a member of the Worshipful Company of Shipwrights last week, perfected a process which enabled the thousands of flame cutting torches used in nearly every shipyard and armaments factory in the United Kingdom to be fuelled by the local gas-works.

Previously the most widely employed fuel gas was acetylene, produced from calcium carbide and water, but the German invasion of Norway robbed Britain of her three factories there, which had previously met all demands of British industry. Britain had to turn to America for supplies. It was estimated that more than 200,000 tons of carbide would be needed yearly, calling for a staggering expenditure of ships and sterling. There were other unfavourable features. Calcium carbide is no cargo for war convoys. It is highly inflammable and is liable to explode. It is hated by every ship captain and dock master. Special safety precautions are necessary at sea and in dock. So the authorities cast about to find a home-produced substitute for acetylene, and they found it in the secret process of Lieut.-Commander Hobbs.

His process is still on the Secret List, but roughly this is what happens: A liquid called Ferrolene is used to step up the temperature of the gas, and this increase, plus oxygen obtained free from the surrounding air and a specially designed flame-cutting nozzle, enables the torch to cut steel equally as well as with acetylene. Lieut.-Commander Hobbs, who calls his invention Ferrogas, served as a pilot in the R.N.A.S. in World War I.

Technical Colleges and Industrial Research

A call for a wide development of research facilities in technical colleges is made to local education authorities by the Ministry of Education. In Circular 94 (Stationery Office, price 1d., 2d. by post), the Ministry states: "The attitude of many local education authorities towards research in technical colleges appears to be somewhat negative. . . . If we are to restore and enhance our industrial position, attain full employment, and an improved standard of life, it is essential that scientific and industrial research is carried out as widely and as extensively as possible and applied promptly to production."

The following are among the suggestions made by the Ministry:

(1) Every teacher who provides satisfactory evidence of his capabilities should be given facilities to undertake the type of research work in which he is interested.

(2) A teacher engaged on such work will be expected to spend about three-fifths of his time on teaching duties, but in some cases he may be allowed to devote the whole of his time in college for a limited period to a particular piece of research.

(3) It is in the national interest that industry should obtain the best and most up-to-date scientific advice, and any scientist or technologist on the staff of a technical college, who is competent to act as a consultant to industry, especially local industry, should be encouraged to do so. His services would not be restricted to any one firm except in respect of some specific inquiry.

(4) Applied research undertaken at the suggestion of industry and commerce is probably the most important and suitable type of work for teachers in technical colleges. The results of research should be published as soon as possible after completion, subject to an agreed delay to allow the firm paying for the work to have priority in their application and to consideration of patent possibilities.

(5) Every encouragement should be given to the development of schools of research, which should enhance both the reputation of the college and the investigator.

(6) It is not desirable to be too rigid in defining the volume and the character of the work to be undertaken; much will depend on the interest of the individual worker and the needs of local industry.

Ewart & Son, Ltd.

The report and accounts of Ewart & Son, Ltd., for 1945 show a loss of £38,672 (including £7,500 written off stocks unsuitable for post-war manufacture), compared with a net profit of £43,026 for the previous year. By bringing in £19,258 provided for taxation in 1944 and not now required, and a balance of £9,655 brought forward from 1944, the net deficit is reduced to £9,759. A post-war contingencies reserve of £10,000 built up in 1943–44 enables the Company to show a small credit balance of £241 on profit and loss account.

Mr. S. Sanders, the Chairman, in his statement issued with the accounts, states that the Company's old premises in Euston Road have been sold at a price £7,252 in excess of the book value. Steps were taken during the year to improve manufacturing and selling facilities. The main additions were at the Letchworth factory, but the Company also took on a lease of a London showroom and sales office in Regent Street, where for a short period accommodation has been afforded to the Home Information Centre organized by the Women's Gas Council and the Housing Centre.

The Chairman's statement adds that although the Company's main pre-war business was the manufacture of domestic hot water appliances, the resumption of building does not mean that its difficulties are ended; those difficulties have been such that it is only just beginning to see an economic level of turnover. Further modernization of production capacity will necessitate the provision of additional finance of a permanent character. It must, he thinks, be accepted that the present capital structure of the Company is thoroughly unsatisfactory with (in round figures) £100,000 out of the total capital of £180,000 in Preference shares carrying a cumulative dividend of 16% per annum, or about £16,000 gross. That dividend is now in arrear to the extent of about £56,000 gross, representing 3½ years' dividends, and seems likely to fall further into arrear during the current year. In his view the Preference shareholders, are virtually in the position of Ordinary shareholders, and such interest as the present Ordinary shareholders have in the Company is of a distinctly deferred character. When the Board reach a conclusion on the extent of the further capital expenditure which they consider desirable to put the Company in a position to produce its post-war products on the most efficient basis, the question of the further capital required may and probably will involve as a preliminary the submission of proposals of some kind for the reorganization of the present capital structure.

Bombs Unlimited

Nearly 150 bombs per hour. That is the record of the Stanton Ironworks Co., Ltd., who were responsible for the manufacture of 150,000 tons of bombs and ingots during the war. Approached by the Ministry of Supply early in hostilities, the company agreed to collaborate in the planning and operation of a plant designed to maintain a continuous supply of 500 lb. bombs. Several changes and improvements were incorporated in the construction and operation of the plant, and eleven months later all was complete and production had started.

Modifications were necessary in the melting plant to overcome the shortage of low phosphorus pig-iron and ferro-alloys. The cupolas were therefore designed to melt charges of 100% steel scrap and to obtain a high pick-up of carbon in the remelted metal. In normal practice a molten metal containing 1½% silicon is required to provide the heat necessary during the conversion process to raise the temperature of the molten metal to a level at which the carbon in the metal can be oxidized and the conversion to steel completed. To overcome the deficiency the metal was superheated in rotary furnaces before being transferred to the converters.

For three years bombs were cast on day shifts only, but the invasion of the Continent brought increased demands, and an "all-out" policy was adopted. The bomb moulds were produced by sand-slingers, each moulding box containing two bombs. After casting, the bombs were cooled, shot-blasted, and annealed in furnaces which had formed part of the spun pipe plants. After passing through a wheelabrator the insides of the bombs were ground and the bombs passed into the machine shop. Here 13 machines carried out the operations of nose-boring, counter-boring and facing, and the tail end was dealt with by 25 semi-automatic lathes. Slots were milled for the tail-end unit, the nose-end was tapped for the nose plug, and, after an air-pressure test, the suspension lugs were welded on and the bomb was completed by varnishing and painting. The record output for one week of 100 hours was 1,628 tons.

It is a remarkable fact that out of the 2,000 workers at Stanton only two had any previous experience of steel foundry work, and it says much for the enthusiasm of the men that they were able to become efficient so rapidly. Sand-milling and vertical core-making machines were operated by women, who constituted 40% of the total personnel. Welfare committees reduced absenteeism to a minimum, and various impromptu concerts served to swell the comforts fund to handsome proportions. The newspaper headlines for the last year of war must have been a fine incentive and reward to the men and women who made bombs unlimited.

Photometric Equipment*

By F. W. SANSOM, M.B.E.

(Exeter)

IT seems to me likely that, during the coming years, much main road lighting will be called for to the standards set out in the M.O.T. report of 1937, and amplified in the new B.S.I. Draft Specification. If this proves to be so it is essential that there should be, in the Gas Industry, engineers capable of designing the new installations, of advising the local authority or other officials concerned on the technical aspects of gas lighting schemes, and that sufficient facilities should be provided at least by some of the larger undertakings in the form of a photometric laboratory and outdoor testing equipment for the proper carrying out of the tests called for in the specification.

It is naturally somewhat difficult to specify what testing equipment should be provided, as so much depends on local conditions; I would suggest that for a moderate expenditure it should be possible to furnish a photometric laboratory with an integrating cube photometer, a simple form of polar co-ordinate photometer, a few candlepower and lumen output standard lamps, a voltage regulating circuit for use with the standard lamps (manual regulation by means of a good variable resistance is quite satisfactory if a fully automatic self-regulating circuit is found to be too expensive), and a test meter for the gas supply to the lamps under test.

For the photometric measurements one of the self-generating photo cell photometers could be used with both the integrating cube and polar co-ordinate photometers, the standard lamps being employed to obtain the necessary correction factor linking scale reading with lumens or candlepower respectively.

Integrating Cube Photometer

I have recently carried out some work with an integrating cube photometer, and some details of its construction (fig. 1) and use may be of interest. It has 6-ft. sides, and is constructed of ¾-in. plywood with external bracing. Several improvements were incorporated in it as a result of earlier experience with a 5-ft. cube. These include positive ventilation by means of light trapped air intakes along the four sides just above floor level, and an extract fan working in a duct fixed at the centre of the roof. The door is divided horizontally 2 ft. above floor level, the lower portion being hinged to open inwards on to the floor of the cube, so that one stands on the outside of this door when making adjustments to the lamp under test.

The interior surface of the cube is first painted with a base coat of lead-free white paint, on top of which two coats of the reflecting medium are applied. For this a suspension of magnesium carbonate in dextrin solution has been employed. The lamp holder for the standard lamp is carried on a swivelling bracket fixed to a 1½-in. by ⅜-in. flat bar fixed vertically on the centre line of the cube 2 ft. from the testing window. This bar also carries the screen to intercept direct light from the lamp under test which would fall on to the window. There is also a shielded lamp at the centre of the side of the cube opposite the window, this being used for the determination of the correction factor for the absorption of light by any lamp being tested. The photometric measuring device is a photocell photometer, the test plate being fixed into the centre of one side of the cube behind a sheet of matt opal glass.

The supply of electric current to the standard lamp is taken through a heavy duty variable resistance, which is adjusted to give the correct voltage measured at the lamp terminals.

The control panel also accommodates the meter portion of the photocell photometer, a test meter to determine the rate of gas consumption of any lamp under test, a pressure gauge, and the various electrical switches.

If the usual experimental precautions are taken, such an arrangement will be found to give accurate results, especially where these are obtained by direct substitution. Its uses are many, chief among them being the determination of the actual lumen output of any gas or electric source, the determination of mantle efficiencies, and the testing of burner and lantern efficiencies. If, as seems probable, street lighting installations have to be provided for a given lumen output, then a reliable integrating photometer will prove to be a most useful piece of equipment for many Gas Undertakings, as by its use one can determine the lumen output of any lighting unit accurately and in the minimum of time.

The Polar Co-ordinate Photometer

A polar co-ordinate photometer must of necessity prove to be more expensive to install, but I would suggest that it is a necessity in the photometric laboratories of the larger undertakings. The draft specification for group A lighting is concerned with the distribution of light from sources to be used, and this can only be determined by the use of such an instrument. The mirror box type, which has three mirrors suitably disposed and rotatable to redirect the light from any selected vertical angle along the axis of a bar photometer, is likely to prove too expensive for general adoption. I would recommend that consideration should be given to that type in which a single large swivelling mirror, suitably inclined to redirect light on to a photocell photometer screened from direct light, is used to intercept the light emitted by the unit at selected vertical angles. With both types the horizontal (or azimuthal) angles are selected by rotation of the lighting unit, calibrated protractors integral with the lamp support and swinging mirror axis indicating their angular rotation.

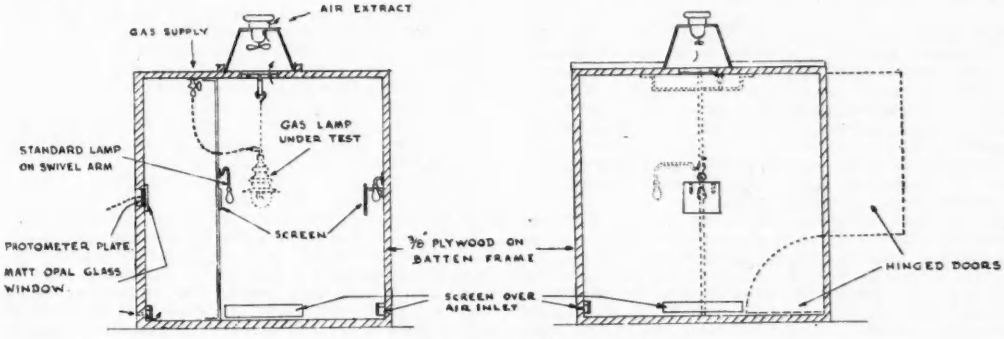


FIG. 1.—*Integrating Cube Photometer.*

The results obtained by the use of such a polar photometer are, of course, plotted on sinusoidal iso-candle diagrams, from which much useful information can subsequently be computed.

Any undertaking having photometric equipment suitable for testing lighting installations on the street for compliance with B.S.S. 307 will find that the same instruments are generally suitable for testing Group A lighting installations for the determination of the "Acceptance Number."

It is, however, laid down in the Draft Specification that the photometer used shall conform to B.S.S. 203 (Type A) for Portable Visual instruments or to B.S.S. 667 for portable photo-electric instruments. My own preference is for the photo-electric type of instrument, as the personal factor is thereby eliminated. With this type of instrument it is necessary to check its accuracy at fairly frequent intervals.

The Scottish Junior Gas Association (Eastern District) recently held a Short Paper Day in the Gas Showrooms, Dunfermline, when the following Papers were given: "Steam Utilization in a Small Works," by J. A. Anderson, Assistant Engineer and Manager, Cowdenbeath; "Purging Operations on a 7,000,000 cu.ft. Gasholder," by J. Harcus, Edinburgh; and "Clerical Work in a Mains Department," by C. Hardie, Edinburgh. A full discussion on each of the Papers terminated the meeting.

* From a Paper presented to the Western Junior Gas Association.

The Place of the Gas Industry in the National Fuel Economy*

By Dr. G. E. FOXWELL

THE objectives of a national fuel policy are deemed to be as follows:

(1) The conservation of our coal reserves.
(2) The efficient use of fuel in existing conditions.
(3) So to plan future industrial developments that the necessary heat and power requirements of the country can be secured at the lowest cost and with the most effective use of fuel.
(4) To develop industries based on coal.
(5) To export products manufactured from coal rather than raw coal.
(6) To develop industries leading to increased employment.
(7) To abolish smoke.
(8) To secure better domestic heat services without material increase in cost or in amount of fuel consumed.

This brief, indeed almost telegraphic, survey of the background conditions in which we now find ourselves will serve as an introduction to the main subject of enquiry: Where does the Gas Industry fit into the pattern of British fuel policy?

Before starting to examine this question, it is well to remind ourselves of the characteristics of coal carbonization.

The Characteristics of Coal Carbonization.

(1) Carbonization, in spite of the heat consumed in the process, conserves coal, particularly for domestic purposes. This arises from the high thermal efficiency in domestic use of gas and coke as compared with the low efficiency of raw bituminous coal. Admittedly, an open coal fire is now claimed to have a similar efficiency (though inevitably lower than a coke fire), but as it is not smokeless, it does not fulfil an essential criterion for domestic appliances, and must be regarded as inadmissible for the purpose.

(2) Carbonization is the only known method of producing smokeless fuel from bituminous coals, and must thus play an essential part in a smoke abolition policy.

(3) Carbonization promotes employment. G. M. Gill and J. Roberts (*J. Inst. Fuel*, **17**, 105) showed that whereas 1 ton of raw coal gives direct and indirect employment to six men for one day, the carbonization of the one ton of coal and the use of its products provides employment of eleven men for one day.

(4) Carbonization provides the bulk of the materials required by the organic chemical industry, including plastics and dyes, and is thus of great importance in the drive for increased exports.

(5) Gas and coke provide the ideal domestic heat service—smokeless, trouble-free, and efficient.

(6) Thus, through carbonization or by the aid of carbonization, the objectives previously deduced as those of British fuel policy can be largely secured.

It will be clear that when the characteristics of coal carbonization—which are broadly the same whether the carbonization be effected in coke ovens or in gas retorts—are set against the objectives of British fuel policy, many of those objectives can be secured by means of carbonization. Whether all of them can be so secured must be examined in the light of the fuel requirements of the country.

Competition and Enterprise.

The fuel industries are the servants of the public, and must as far as possible study how to give the public what it wants within the limits of a sound national fuel policy. The framework of civilization is becoming more scientific and more highly organized. The fuel industries in the future must fit into the general framework. There is room for all, and each has its place. There must be no absolute rigidity in the purposes for which certain fuels are used, because technical improvements may cause a fuel formerly considered unsuitable for a particular use to become better for that purpose than its competitors. The gateway to opportunity for technical advances must be kept wide open to all. Whether our fuel industries are nationalized or not, one of the abiding principles must be that healthy competition on technological grounds shall continue. How that would be brought about in a group of nationalized fuel industries is impossible to forecast.

The Utilization of Fuel in Britain

The following figures (Table I) of coal consumption are taken from the *Statistical Digest*.

These figures deal only with coal and do not include coke or gas. Figures of coke available have been added.

TABLE I.

Uses of coal.	Millions of tons of coal. 1938.	1944.	
Gasworks	19.1	20.8	(Coke available; about 10)
Coke ovens	19.1	20.1	(Coke available; about 13)
Collieries	11.9	11.1	
Railways	13.2	15.2	
Electricity	14.9	24.1	
Iron and steel	42.0	10.3	These quantities do not include coke or gas.
Engineering		4.5	
Other industries		26.8	
Domestic (below 100 tons p.a.)	45.8	35.4	
Non-industrial (above 100 tons p.a.)	3.8	3.4	
Other minor uses	8.7	13.6	Increase due to Services requirements.
Exports and Foreign bunkers	46.3	5.6	Does not include coke.

In which of these uses of coal should gas play a part, always remembering that the function of the Gas Industry as at present organized is to provide heat in the form of a refined fuel which may be used to better effect than raw coal, or which may be more convenient and lead to lower costs of production?

Certain of them must be ruled out from the start. The Gas Industry can play little part in fuel utilization at collieries and on the railways. Very large quantities of coal would be saved by electrification of the railways, and this is a major reorganization that has received support in many quarters. Some 30,000,000 tons of coal are used in industrial boilers. While the Gas Industry contributes a little coke breeze and larger coke for this purpose, it seems evident that raw coal will continue to be the primary fuel for boiler firing, and there is unlikely to be any direct advantage in using coke for this purpose, bearing in mind that the efficiency of carbonization is about 80%, so that 20% of the heat of the coal is lost during carbonization. These three uses—collieries, railways, and industrial boilers—thus rule out some 56,000,000 tons of coal a year from the scope of the Gas Industry.

It is true that fuel utilization in the iron and steel industry is largely based on carbonization. The lowest fuel consumption is obtained in large self-contained works in which all the coal used in the works enters through the coke ovens. The tendency is for the iron and steel industry to build its own ovens and to make its own coke. Coke ovens owned by iron and steel works are part of the steel industry, and cannot in any way be brought under the wing of the Gas Industry. Special steels are made (for example in Sheffield) in independent works not possessing either blast furnaces or coke ovens. It hardly comes within the purview of this paper to discuss to what extent the steel industry should be centralized. Existing independent works can with advantage be supplied with gas from coke ovens in place of producer gas, but it is by no means certain whether oil has not such advantages as may sooner or later cause both producer gas and coke oven gas to be supplanted for high temperature work such as the open hearth furnace, and this has happened in America, where 80% of the steel production is made with oil. Thus the iron and steel industry is based on carbonization, but only looks to "external" carbonization plants to supply any coke that may be required in excess of what its own coke ovens can manufacture, and gas and coke to special works—*e.g.* Sheffield steel-works, not attached to self-contained iron and steel works.

We now turn to the industrial field. The engineering and many of the "other industries" of the country require town gas and coke. The quantity that will be needed in the future will depend on the economics of these refined fuels as compared with raw coal, producer gas, and oil. There is undoubtedly a tendency to use refined fuels, and this tendency may well increase as the cost of labour advances. The field for gas (and coke) is where these fuels can show solid technical and economic advantages. Thus it becomes clear that it is essential that such problems of fuel utilization should be discussed and resolved upon a severely technical and economic plane. This emphasizes the importance of maintaining and extending the industrial gas centres. Whether under nationalization there is or is not any incentive to increase sales, it is clearly of the first importance to British industry that there shall be available sound technical advice upon fuel utilization, given, not by engineers of the Ministry, but by experts in the utilization of each competing fuel.

Coke can make an important contribution to exports, and, being a product manufactured from coal, would be a better export than raw coal, provided the coke exported was not needed for use in Britain. For "non-industrial" uses of solid fuel, such as central heating boilers, many fuels are in competition. In plant of the right type coke can hold its own with any fuel on cost and convenience and is, and will probably remain, widely used for that purpose. Under a policy of

* Paper presented to the Southern Association of Gas Engineers and Managers (Eastern District), April 26.

smoke abolition, the use of such smokeless fuels as coke for this purpose would be extended.

About 80% of the town gas produced in this country is used for domestic purposes. This is a market which gas shares with all other fuels. Competition has not always been on healthy lines, and one beneficial effect of nationalizing the fuel industries might well be to achieve the utilization of the very large quantities of fuel used for domestic and similar purposes on sound technical principles rather than by sales talk or doubtful commercial expedients. This will be discussed in more detail, but first the position of electricity in a technically sound national fuel programme should be clarified.

Electricity

Much has been heard recently of allowing the domestic consumer free choice between gas and electricity. From the angle of the efficient use of fuel, the use of electricity for heating should be condemned. Whilst the efficiency of a modern condensing power station on full load may be slightly above 30%, for various reasons the real efficiency of electrical generation is a good deal less. In his paper "Inefficiency" to the Institute of Fuel, Mr. Oliver Lyle has given the average thermal generating efficiency of power stations as 21%. When the distribution loss is taken into account the thermal efficiency of electricity from coal to consumers' premises becomes only 17%. It is not used for heating with 100% efficiency—that applies only to space heaters under favourable conditions. Taking water heating and cooking into account the heating efficiency is probably not greater than 75%, making the overall thermal efficiency of electricity for heating from coal to useful heat as 12¾%. Mr. Lyle gives to gas and coke a combined thermal efficiency from coal entering the gas-works to useful heat in the consumer's appliances (including the efficiency of the appliance) as 38%. With modern appliances this efficiency can be much greater than 38%, probably at least 55% (see later). There is no technical justification for the use of electricity for space heating, cooking, or water heating.

Before dismissing electricity as inadmissible for these purposes, it is well to note that the position might well change if the efficiency of the use of coal at power stations could be very considerably increased.

It has been widely stated that this increase could be secured by the use of the exhaust steam from the turbines for district heating. It must be remembered, however, that if the exhaust is to be at a sufficiently high temperature to be of value, the exhaust pressure must be increased, and consequently the output of power per unit of steam will be decreased. Prof. Kapp (*J. Inst. Fuel*, **19**, 79) says: "Broadly speaking a station can use a given rate of coal consumption either for the generation of 100,000 kW. of electrical energy alone or of, say, 80,000 kW. of electrical and 180,000 kW. of heat energy. There is in consequence a saving of more than one-third if heat and electricity are produced from a combined station instead of from two separate stations." This may be computed to represent an efficiency of heat and power generation of about 55%; it should be compared with the figure from an efficient carbonization plant of 80%. Certainly, the power station would be greatly improved, but, whereas the average efficiency from coal to useful heat from a gas-works would be of the order of 55% with modern domestic appliances, the efficiency of the combined power station with pass-out steam at a reasonably high temperature from coal to useful heat would not be more than about 40%. It is to be hoped that this increased power station efficiency can be secured in the interests of coal conservation. Nevertheless, since it does not appear likely that there will be any general move in this direction at power stations, the use of electricity for heating and cooking will here be regarded as indefensible in any technically sound national fuel economy.

Sound as this conclusion may be from the 1946 angle of pure fuel technology, do not let us forget that most of the methods at present known to us by which we can or may be able to obtain heat and power 150 years hence necessitate the conversion of natural energy (including atomic energy) into electricity. We may, therefore, anticipate the eventual disappearance of the Gas Industry by that time because of the exhaustion of its essential raw material, and the eventual dependence of the human race on electricity for heat, light, and power.

The Place of the Gas Industry

This discussion has cleared the way for some appraisement of the place of the Gas Industry in the national fuel economy. Here let it be said at once that when the coal and other fuel industries are reorganized, there would seem to be no defensible argument strong enough to prevent the carbonization industries being regarded on national grounds as a single entity. That would mean that gas undertakings and those coke ovens not situated at iron and steel works would be regarded as a part of a single carbonization industry. There is some evidence that this step is already in the mind of the Minister of Fuel and Power. At the Committee stage of the Coal Bill Mr. Shinwell said (*Official Report of Standing Committee C, Feb.* 27, *p.* 277): "Take, for example, the provision of coke ovens on a far-reaching scale for the purpose of providing a grid gas scheme, because we have in contemplation the transfer of ownership in the Gas Industry and we have to look ahead. Supposing that was in contemplation, clearly the reorganization of the collieries themselves must be undertaken with full regard to the potentialities of the coke ovens." Those who are interested in this phase of the subject are referred to a paper presented by the present author to the Coke Oven Managers' Association in February, 1945 (*Gas World, Coking Section, Feb.* 3, 1945), in which proposals were made for a Central Carbonization Board to control a combined carbonization industry on lines somewhat similar to existing Public Corporations.

The analysis that has been made earlier of the characteristics of the carbonization process and of the value of its products will serve to show the vital place that coal carbonization must have, at least for the next 100 or 150 years, in the national fuel policy. It is regarded as essential that there should not be, as at present, separate coking and gas industries, but one single carbonization industry. The present author sees no objection to regionalization, provided that it is not carried out by drawing arbitrary lines on a map, as the Heyworth Committee appears to have done, but is applied to carefully selected districts which should comprise as entities those industrial areas wherein gas grids could properly operate. Gas grids should not be selected according to whether they are immediately paying propositions, but rather on the lines of a public utility service which supplies the means for obtaining gas in the expectation that demand will follow.

The place of the Gas Industry is therefore conceived to be as follows:

(1) It should be part of a combined carbonization industry, the coke ovens at collieries being linked administratively to the Gas Industry and not to the collieries.

(2) It should supply gas and coke to industry as and where required.

(3) It should supply the whole domestic requirements of heat and cooking, in combination with smokeless coals.

(4) Industrial areas should be supplied by gas grids based on gas-works and coke ovens, carbonizing works being situated at such places as will lead to the cheapest gas having regard to the cost of gas to the consumers throughout the area.

Should All Coal be Carbonized?

Enthusiasts for carbonization in the past have answered this question in the affirmative, but there is no simple answer. Since it can be shown that gas and coke can be used with greater efficiency in the domestic grate than raw coal by existing methods, and since only by using smokeless fuels can the abolition of smoke be secured, one answer is that all coal used for domestic purposes should be carbonized, always excepting the smokeless coals handled by the Solid Smokeless Fuels Federation.

Industrial coal comes under different considerations. Where a case can be made on economic grounds for using town gas in preference to raw coal or producer gas, the coal must be carbonized. Coke is usable for most industrial combustion purposes at a higher efficiency than coal because of its lower hydrogen content, but generally the increased efficiency from coke is not sufficient to make up for the heat consumed by the carbonization process. There is no argument for the general carbonization of all industrial coal on grounds of coal conservation, but there is a limited field when the resulting town gas can be used to advantage.

A Gas Industry or a Two-Fuel Industry

It has been indicated that cost is a vital factor for at least half the consumers of the country. The cheapest heat service is secured by a combination of gas and coke (L. W. Andrew, E. W. B. Dunning, and G. C. Holliday, *Trans. Inst. Gas E. Comm.* 278). The domestic coke-fired hot water boiler which warms the kitchen, burns the refuse, and heats the water is a highly efficient appliance. There is an undoubted demand for solid fuel open fires, which must be supplied. Until the majority of people will accept gas fires and gas can be supplied at the same price per useful therm as coke, the Gas Industry must remain a two-fuel industry. It is likely, however, that changing tastes and social habits will progressively favour gas. The cost of an all-gas service, however, must not be markedly greater than that of a two-fuel service.

The Economies of Coke Production.

Coke is often termed a by-product of the Gas Industry. The industry sells about twice as many therms of coke as it does of gas. In one sense coke is like the exhaust steam leaving the turbine of an electrical generating station. It is to the fact that it can use its residual coke whereas the residual heat from the turbine is not used that the Gas Industry owes its present thermal superiority over the electrical industry. If the Gas Industry failed to utilize the whole of the coke it produced it would cease to merit the recognition here accorded to it as a conserver of coal.

The method of costing gas production has long been such that everything except gas is regarded as a "residual." This method has been convenient no doubt, since it saves the cost accountant from some bad headaches, and because the values of coke, tar, ammonia, and benzole are not based upon costs of production, but upon the market prices of competing products. This method of costing, however, has obscured the value and importance of coke. The true costs of production should be ascertained for each of the products of the Gas Industry.

The best results can only be secured by treating coke as a primary product, and giving similar consideration to coke in production and sales to that which would be given to any other primary product. If the carbonization industries are successfully to provide all the smokeless fuel required in the country for domestic purposes, great attention must be paid to the quality of the coke and to the appliances in which it is used, so that there shall be no cause for dissatisfaction on the part of the user.

Building Construction.

A great deal of fuel can and should be saved by proper insulation of houses. No ministries or local authorities or architects yet appear to have grasped the importance of building to U = 0.15 (as recommended in the *Housing Manual*), and of lining the walls of living rooms with insulating material. It is equally important to insulate industrial buildings.

The Supply of Smokeless Fuels.

It will thus be seen that the future place of the united carbonization industry is to supply refined fuel in the form of gas and coke to all industries that require it, and that a complete technical advisory service should be maintained for industry.

The major task, however, should be to supply, in conjunction with all bodies comprising the Solid Smokeless Fuels Federation, all the fuel required for domestic purposes. The possibility of doing this requires investigation. Some data and considerations will be given based on a paper given by the author in Manchester last November (*J. Inst. Fuel*, **19**, 103).

The Supply of Domestic Fuel by the Carbonizing Industries.

The supply of domestic fuel must be based on the following considerations:

(1) All fuels and appliances must be smokeless.
(2) In order to conserve coal and to secure the minimum cost, the thermal efficiency of use must be the maximum practicable.
(3) Modern high-efficiency appliances must be installed in all houses, old and new, at the earliest opportunity.
(4) Houses must be adequately insulated.

Fuel Consumption per Household

While there is no such thing as an "average" household, it is considered that the probable quantities of fuel used for domestic purposes was divided between the 12,000,000 households in the country as in Table II.

TABLE II.

	Total consumption.	Consumption per household (round figures).	Average efficiency in use per cent.	Useful heat therms.
Raw coal	42,500,000 tons	3½ tons	18	189
Town gas	1,200 million therms	100 therms	50	50
Coke	5,000,000 tons	0.4 tons	40	45
Electricity	4,800 million units	400 units	75	10
				294

This estimate is a little too high for the artisan or working-class house because it necessarily includes all houses, whatever their size, and smaller offices and shops.

Plans for post-war houses propose a higher standard of heating. The amount of heat to be supplied depends on the appliances installed. Estimates of the heat requirements for the new smaller houses in the South of England have been given by L. W. Andrew, E. W. B. Dunning, and G. C. Holliday, in Communication 278, to the Institution of Gas Engineers, 1945. In the latter paper (based on the draft codes of functional requirements) it is shown that the lowest cost is obtained by the use of a combination of gas and coke. Taking coke at 45s. per ton and gas at 9d. per therm, the authors calculated that for the same house—3 bedrooms, 1 living-room, meals taken in the kitchen—and for the same space heating, cooking, hot water, &c., service, costs with modern post-war appliances are as given in Table III.

TABLE III.

Reference No. in original paper.	Gas used. Therms.	Coke used. Cwt.	Cost per week average through the year. s. d.
1A	217½	60	5 9
1B	231½	57½	5 10
1C	265	40	5 6
1D	435	25	7 4
1E	565	None	8 2

The essential differences between the fuel-using equipment in these houses is that in A and B there is a coke fire in the living-room and a coke boiler in the kitchen; in C the water is partly heated by a back boiler attached to the open coke fire in the living-room and the kitchen coke boiler is omitted; in D there is a coke fire in the living-room without a back boiler, no coke boiler in the kitchen and the water and the kitchen are heated entirely by gas; in E (all-gas) there are gas fires in both kitchen and living-room, water being also heated wholly by gas.

If scheme 1A, 1B, or 1C be assessed on the probable efficiency of the appliances, it can be calculated (see Table IV) that the arrangements for the post-war house involve the supply of some 467 to 563 useful therms per year for this type of house of normal (uninsulated) construction, of which about 200 to 300 therms will be used for space heating, though as some appliances have a dual purpose it is not easy completely to separate their functions.

These figures are for the Southern part of the country. The North is said to need more heat, and the overall figure for the whole country will be higher by, say, some 50 to 60 therms per household.

TABLE IV.

	Fuel used, therms.	Assumed efficiency per cent.	"Useful therms."
(*a*) Space heating—			
Gas fires (bedrooms)	20	50	10
Hall heating	15	90	13½
Radiant bathroom heater	2½	100	2½
Portable gas fire, living-room	10	90	9
Coke fire (modern type) living-room	340	35	119
Gas ignition	10	...	10
Coke boiler—40% of its "useful therms" for space heating	410	65	107
Gas ignition	1½	...	1½
Surplus heat from cooker	80	40% for 30 weeks	18½
			291
(*b*) Hot water heating—			
Coke boiler—60% of its "useful heat" for hot water heating	410	65	160
Sink heater	15	55	8½
Circulator for baths	15	55	8½
Wash boiler	10	55	5½
			182
(*c*) Cooking—			
Gas cooker	80	50	40
			513
Add refrigeration			50
			563

The plans for post-war houses recognize that low heat standards have prevailed in the past, and suggest that the consumer should be supplied with nearly double the quantity of "useful heat." Figures given in Table III visualize consumptions of gas and coke varying between 217½ therms of gas plus 60 cwt. of coke and all-gas (565 therms). The present gas-works practice may be taken as providing for sale coke and gas in the ratio of about 1 cwt. of coke to 8 therms of gas, with some permissible variation due to methods of operation, water gas, &c. The figures quoted in the table involve the following ratios:

Scheme No.	Therms gas per 1 cwt. coke.
1 A	3.6
1 B	4.0
1 C	6.6
1 D	17.4
1 E	All gas

There should therefore be no insuperable difficulty in balancing the demand for gas and coke.

Effect of Efficiency of Appliances

From Table II it may be calculated that the heat used per household is 1,275 therms; the yield of useful therms is 294; the overall thermal efficiency of use of all domestic fuels is thus 23%.

Taking the figures given by Andrew, Dunning, and Holliday (excluding the refrigerator) for their house 1 B, 929 therms are supplied and the yield of useful heat will be 513 therms. Thus with modern appliances, an overall heating efficiency can be secured by the use of gas and coke of 55%.

If the building is properly insulated to U = 0.15, it can be shown that nearly half the fuel used for space heating can be saved and the efficiency of use raised to a much higher figure.

Total Smokeless Fuel Required.

It may be concluded from the figures given by Andrew, Dunning, and Holliday that some 563 useful therms are needed per household per year in the South of England. The author has calculated that with adequately insulated houses this can be reduced to 450 therms. The importance of proper housing construction must be emphasized. Thus the total heat to be provided under a sound national fuel policy for 12,000,000 houses becomes 12,000,000 × 450 or 5,400,000,000 useful therms a year.

Under present conditions we require 12,000,000 × 294, or 3,528,000,000 useful therms.

Thus it appears that by making use of good constructional methods in housing designs, involving thermal insulation to the economic limit, and by installing modern high-efficiency heating and cooking appliances, the pre-war figure of 1,275 gross therms supplied per household (deduced from Table II) can be reduced to $(450 \times \frac{100}{55})$ 818 therms per household with nearly twice as much useful heat supplied to the consumer.

New Plant Required.

From the gas-works carbonization of 1 ton of coal is obtained not less than 210 therms of gas and coke for sale, rising to 220 therms

under good conditions (in addition to tar and other by-products). The yield from coke ovens is about the same or slightly more. The average efficiency with which the gas and coke can be used in the new appliances is computed as 55%. A figure of 120 useful therms may be taken without serious error as the yield of saleable coke and gas per ton of coal carbonized.

In 1943 the Gas Industry sold 975,000,000 therms of gas to domestic consumers, and it is believed that the 1938–9 figure is about 1,200,000,000 therms (Table II). As previously stated, it is considered that a reasonable estimate of "domestic" coke sales is 5,000,000 tons, or, roughly, 1,400,000,000 therms. This total of 2,600,000,000 therms used at 55% efficiency in the new appliances suggests that the present capacity of the gas and coke-oven industries, after supplying all existing needs of other users, can supply some 1,430,000,000 useful therms for domestic users out of the 5,400,000,000 useful therms that will be needed ultimately. That leaves 3,970,000,000 useful therms to be supplied by a combination of new carbonizing plants and smokeless coals (anthracite and dry coals).

If all this increase were to be provided by the carbonization of coal it would require new plant to the extent of 3,970,000,000 ÷ 120, or an addition of some 33,000,000 tons of coal to be carbonized per year. That means that the present combined annual capacity of the coke-oven and gas industries would have to be increased from 40,000,000 tons to 73,000,000 tons.

During the four year 1934–7, inclusive, the orders for new coke ovens given in Table V were placed.

TABLE V.

Year.	Capacity tons dry coal/day.	Equivalent tons coal/year at 90% capacity.
1934	7,620	2,500,000
1935	7,134	2,340,000
1936	6,090	2,000,000
1937	6,654	2,170,000

Thus, in round figures, the coke oven builders of that period were able, in the five years starting 1934 and ending 1938, to build 9,000,000 tons coal capacity of new coke-oven plant in this country. In addition, a good deal of new gas-works plant was built, comprising both carbonizing plant and water-gas sets. It would be fair to put our future capacity to build new carbonizing plant in this country at or slightly above 3,000,000 tons a year. The 33,000,000 tons of new capacity could thus be built in about 10–11 years, given reasonable conditions of labour and materials similar to those of 1934–8.

Smokeless Coals

This, however, does not exhaust what can be done. The output of anthracite and of dry steam coal could be increased considerably if the demand was established. Reserves of the necessary coals are available; mining equipment and labour for opening up new pits would be required. This would take some considerable time to effect, but the period of 10 years could be appreciably reduced by encouraging the development of smokeless coals for "domestic" purposes.

In the years immediately prior to the war the total annual output of South Wales anthracite and dry steam coals (the types regarded as smokeless) was about 11,000,000 tons. Of this, 55 to 60% was sized, most of this sized coal being suitable for the domestic market. It is difficult to say how much was actually used for domestic purposes since the 6,000,000 to 6,500,000 tons suitable for the purpose would be included in the 42,500,000 tons given in Table I. It is believed, however, that about 1,500,000 tons of these smokeless coals were used for "domestic" purposes. Thus an additional 5,000,000 tons of smokeless coal per annum could be diverted from other categories of consumer to the domestic market if output regained its pre-war level.

The present total annual output is only 6,500,000 tons of South Wales anthracite and dry steam coals, but this could probably be doubled from existing pits within something like three years, provided sufficient labour and materials are available, thus making some 7,000,000 tons of these smokeless coals which could be used for domestic purposes.

If the demand were established (*e.g.*, by the enforcement of smoke abolition), new pits could be sunk, and an annual output of 20,000,000 tons of these coals would be possible, of which perhaps 12,000,000 tons could be used for "domestic" purposes as defined in the *Statistical Digest*.

Smokeless coals would be used with the same thermal efficiency as other smokeless fuels and might yield some 2,000,000,000 useful therms.

Summary of the Supply Position.

Thus, the conclusion is reached that within three years of being allotted adequate labour and materials the smokeless fuels industry could supply yearly (Table VI)—

TABLE VI.

	Millions of "useful" therms.
From carbonization:—	
Present capacity	1,430
New capacity (9,000,000 tons coal carb.)	1,080
From smokeless coals:—	
7,000,000 tons coal	1,155
	3,665

Whether development after this stage would favour greater use of smokeless coals and of the products of carbonization would depend on the demand and on the available reserves of the various coals. Certainly the combined smokeless fuel industries can meet any demand likely to be made by a policy of smoke abolition, if materials and labour are made available to them as before the war. Further expansion would be necessary to provide the 5,400,000,000 useful therms previously calculated to be required ultimately when all buildings are supplied with heat to modern standards by modern equipment.

The Total Load

Coal can be mined at any time, stored and used as required. Coke can be produced at any time, stored and used as required. Gas cannot be stored more than 48 hours as a maximum. The requirement of coal conservation demands that coke shall not be produced under such conditions that the gas is wasted—*i.e.*, the demand for coke and gas must be balanced at all times.

This balancing can be effected in various ways, such as by the extensive use of water-gas plants and by heating carbonizing plant alternatively with producer-gas and rich gas, according to the demand. The new methods of total gasification now being investigated by the Gas Research Board may well become practical processes within the next 10 years, and would solve the problem if the demand for gas exceeded the demand for coke.

The carbonizing industry is highly flexible, but (neglecting for the moment the smokeless coals) if the demand is to remain balanced when production is by normal gas-works methods, for every 1 cwt. of coke produced for sale at least 8 therms of gas must be sold. If the relative demand for coke is greater than this, part of the gas must be used for heating the ovens or retorts. When this is done, as in coke ovens, some three therms of gas are produced for sale for every 1 cwt. of coke sold. Even if the relative demand for solid smokeless fuel exceeds this ratio, the smokeless fuel industry would not become unbalanced. There is still the very considerable quantity of smokeless coal available. Moreover, the recovery of methane or other gases from the coal gas would divert part of the gas production to the chemical industry. Clearly, the supply of smokeless fuel will remain sufficiently balanced to avoid blowing gas to waste so long as not less than about two therms of gas can be sold for each 1 cwt. of coke sold.

The Seasonal Load

It has been suggested that a policy of using smokeless fuel in place of bituminous coal must fail because the sudden demands of cold weather can only be met by solid fuel, which can be stored. The effect of seasonal loads on production will be briefly examined here. This examination indicates that there is no inherent impossibility in meeting the seasonal load for smokeless fuel, but the position requires more extensive analysis to determine how it can best be met.

The analysis given for house 1 B (Andrew, Dunning, and Holliday, *loc. cit.*) is taken as the basis. Consumption is divided by these authors into 30 winter weeks, 9 cool weeks and 13 summer weeks. The gas used for the refrigerator has been allocated (by the present author) to the latter two periods, and that for the wash boiler spread evenly over the year.

The analysis then shows as the total gross fuel supplied (Table VII):

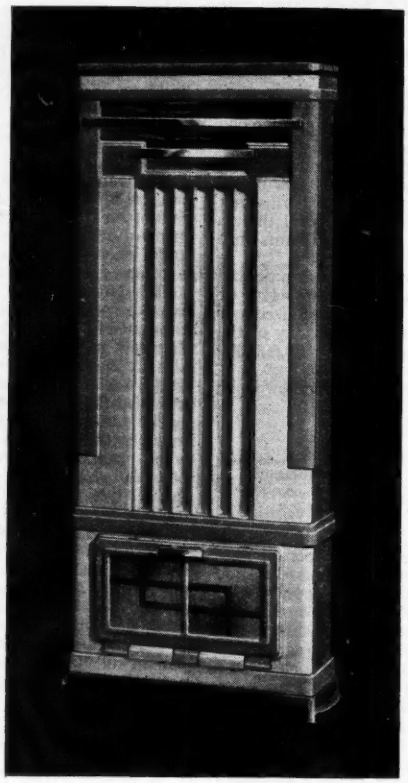
TABLE VII.

	30 winter weeks.	9 cool weeks.	13 summer weeks.
Coke consumption—cwt.	50	7½	None
Gas consumption—therms	135.8	30.2	65.7
Ratio: therms gas/cwt. coke	2.7	4.0	All gas
Gas consumption per week, therms	4.43	3.36	5.07

This is one specimen type of house. Others use more coke in the summer (*e.g.*, for hot water), and others again use more gas in the winter. Industrial coke and gas are used all the year round. Generally speaking it appears that the load could be so adjusted that the gas consumption would be fairly constant all the year round. Coke would then be produced in the summer and stocked for the winter. Smokeless coals would be produced all the year round. There would seems to be no reason why coke and smokeless coals should not be produced and supplied to consumers just as is bituminous coal, and stored by the consumer. Known methods—*e.g.*, shutting down water-gas plants and heating retorts by gas—could be used to increase coke production during the summer without waste of gas. The gas grids would help materially in keeping a supply of gas available as and when required and in smoothing our local fluctuations in demand.

Conclusion

It will have become clear that in the writer's opinion the Gas Industry for at least so long as coal remains the principal source of heat and power in the country has a very important part to play in British fuel economy. It provides a method by which our coal reserves can be used to the best effect for many industrial purposes and practically all domestic purposes.



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Individual and District Heating Systems

A "GAS JOURNAL" Abstract

In a Paper at a Joint Meeting of the Institute of Fuel and the Institution of Municipal and County Engineers, Mr. D. V. H. Smith put in a powerful plea for district heating with *ad hoc* boiler installation applied to new housing schemes of sufficient density, 12 to 22 houses per acre. It is useful to compare it with the First Report of the District Heating Committee of the Institution of Gas Engineers.

The Paper gives costs of heating three types of buildings, schools, feeding centres, and factories (several examples of each), and shows that the total cost of "useful heat delivered" ranges from 7.864d./therm for schools to 6.90 and 5.66 for factories, with one exceptionally well-designed and efficiently-run factory at 4.135, all based on costs current in December, 1945.

Cost of space and water heating in dwelling-houses is calculated, "using the traditional methods of open fires," at 21.6d./useful therm (coal at 12,500 B.Th.U./lb. and £4/ton) and 14.8d. with combination grate, annual costs being £21 15s. and £23 12s. 6d. respectively.

For comparison a table re-arranges the figures of Table IX of the Institution's Report, p. 25, "Make-up of Selling Price of Gas and Electricity." Mr. Smith thinks that instead of reducing the cost of electricity by one-third, to allow for its higher efficiency in use, the cost of gas should be increased by 50%. The following is the Table:

FROM TABLE IX OF THE FIRST REPORT OF THE DISTRICT HEATING COMMITTEE OF THE INSTITUTION OF GAS ENGINEERS.*

Make-up of selling price of gas and electricity.

	Gas, pence per therm.	Electricity, pence per therm.
Net raw material	1.3	4.8
Manufacture, salary and wages	0.6	0.9
Repair and maintenance	1.2	0.9
Total manufacture	3.1	6.6
Transmission and distribution	1.4	2.4
Management	0.5	3.6
Rates	0.6	2.4
Work for consumers (net)	0.1	−0.3
Capital charges and profit	1.6	14.7
Lost in bulk transfers	—	0.6
	7.3	30.0
Cost per useful therm, allowing for relative efficiencies of gas and electricity	10.95	30
Ditto, with gas at 1s.	18.0	30

* It should be noted that these are stated to be at 1937 cost levels for gas, and 1938/9 for electricity.

Systems of heat distribution in general use are summarized, and while Mr. Smith agrees with the Institution of Gas Engineers that "when dealing with . . . a whole district . . . and generally for public buildings and dwelling-houses low-pressure hot water seems to be the simplest to install and operate," he does not agree with their criticism of such a system. On the contrary, he says that "it is possible to convey steam and hot water literally for several miles with a small proportion of loss—the losses are greatest with high-pressure or medium power steam, and *lowest with low-pressure hot water*.† . . . For two mains, a flow and a return, conveying low-pressure hot water a distance of one mile, the loss can be as low as 1 or 2%, and for a complete distribution system supplying an area of 100 acres it may be as low as 8 or 9% and should not exceed 15%."

Another table sets out in detail the costs in five different cases, covering from 8,000 to 400 houses each, and one case of 602 flats. The cost per useful therm "to housing" ranges from 8.4 to 6.8d., and "excluding internal work" from 6.22 to 4.72. These costs appear to cover background heating and hot water supply, but topping-up is to be added. "Some source of radiant heat is desirable, but if the bulk of the heat is obtained from a district heating system . . . leaving the occupants to 'top up' . . . by gas, electricity or an open fire as desired, *district heating need not be regarded as a competitor of other methods*.† It will simply supply background heat cheaply, and enable the existing services of gas or electricity *to get all the extra load they can cope with* and *charge a really economic figure for it*."†

The conclusion of the matter is summarized in the following table:

SUMMARY OF COSTS PER THERM IN PENCE OF HEAT SUPPLY TO VARIOUS CLASSES OF BUILDING.

	Average cost of useful heat delivered to the building, excluding costs of internal heating appliances.* d.
Electricity	30
Gas 10.9d. to 18d.	14
Dwelling-houses with open fires	18.2
" with 1 open fire and central heating	8.48
Public buildings—	
Small industrial buildings	6.9
Large industrial buildings	5.66
District heating, housing only, charging other buildings at normal rates	5.06

* Averages all obtained from data given in the Paper.

† Our italics.

In general, then, there is agreement only with the first conclusion of the I.G.E. Report: "That district heating . . . has considerable merits as a method of . . . coal economy." But "district heating combined with electricity supply" does not meet with Mr. Smith's approval. In his view "that is of entirely secondary importance and in the case of large existing stations it is a Utopian policy which is not worth pursuing"; but he does agree that existing smaller stations, which otherwise might be discarded by the C.E.B., might, where favourably situated, get a new lease of life in this way. Disagreement on this important point, however, makes it practically impossible to compare Mr. Smith's estimates with those of the Institution of Gas Engineers, because the latter are confined, with respect to district heating, to the combination of water heating with electricity generation.

Decision in this matter is urgent. "Local authorities are already stirring, but only the Ministry can act."

And, finally, "the principal grounds for the adoption of district heating are—

"One: . . . A district heating scheme can use any fuel—coal, coke breeze, dross, slurry, town gas (*sic*), refuse, sewage gas or anything available that will burn. . . .

"Two: The serious position of housing demands new and improved methods which will help out an overtaxed building industry. District heating as a method has been tried and found economical; it is *not* to be classed with temporary and costly methods which ought never to have been foisted on the country."

Gas Undertakings' Results

Auckland Gas Company (New Zealand).—The surplus for the year ended Dec. 31, 1945, including Government subsidy of £42,409, and after deducting working expenses, rates and land tax, depreciation, and other charges, was £83,039. Income from gas, residuals, and fittings was £540,876, and manufacturing costs, less subsidy, were £289,546. Income tax estimated on assessable income for the year, and social and national security taxes, absorb £71,124. A dividend of 2½% for the year leaves £1,185 to be carried forward.

Hornsey Gas Company.—The revenue account for 1945 shows a balance of £34,351 carried to net revenue account, compared with £29,216 for the previous year. Dividends have been declared at the rate of £5 2s. 6d.% on the 5% Standard stock, and £3 12s. 6d.% on the 3½% Standard stock, leaving £13,737 to be carried forward, against £11,390 brought in. Gas sales were 5¼% higher than in 1944, mainly owing to the increased demand experienced in the second half of the year. Consumers totalled 26,218 at the end of the year, compared with 25,371 at the end of 1944. Severe damage to property in the Company's area of supply due to enemy action has resulted in a reduction in the number of consumers compared with the total immediately before the war, and in consequence the quantity of gas sold last year was 12% less than in 1938. Hornsey suffered more raid damage than any other borough in Middlesex, and it is worthy of record that during the whole period of the war the gas supply was maintained without serious interruption. There are indications in the current year that further recovery of business is taking place, and a progressive improvement may be expected as new building develops and property repairs are effected.

Imperial Continental Gas Association.—The Board will recommend at the annual meeting on June 7 that for the year ended March 31, subject to the verification of the accounts by the Auditors, an Ordinary dividend of 5% and a Special dividend of 3%, both less tax, making 8% (actual), less tax, be paid on the £5,600,000 Capital Stock on June 21. Net profits, after providing for taxation, amount to £217,393. Of that sum £154,144 represents profits attributable to the year 1945/46 and £63,249 to the previous years. The proposed dividends require £246,400, and necessitate the appropriation of £29,007 from the balance of profits brought forward from the previous year.

Wellington Gas Company (New Zealand).—After payment of an interim dividend of 3% on Ordinary shares, the year's dividend on Preference shares, and providing for taxation, depreciation of plant, buildings, and machinery, the balance to the credit of profit and loss appropriation account for 1945 was £22,490. A final dividend of 3%, making 6% for the year, leaves a balance of £14,125 carried forward. Speaking at the annual meeting, Dr. C. Prendergast Knight, Chairman, said a new water gas plant of the latest design, consisting of two complete units each of a daily capacity of one and a half million cu.ft., was being installed by Humphreys & Glasgow, Ltd. It had been hoped that the plant would be available for gas-making during the coming winter, but shipments had been delayed.

York Gas Company.—The profit for 1945 after payment of Debenture interest and crediting income tax, bank interest, &c., was £16,413. Gas sales amounting to 5,547,974 therms yielded £208,171, compared with £183,838 for the previous year, and the amount carried from revenue to profit and loss account was £10,422, against £16,671 for 1944. A final dividend of 3% on Consolidated Ordinary stock makes a total of 5% for the year, and leaves a net revenue balance of £4,652 to be carried forward.

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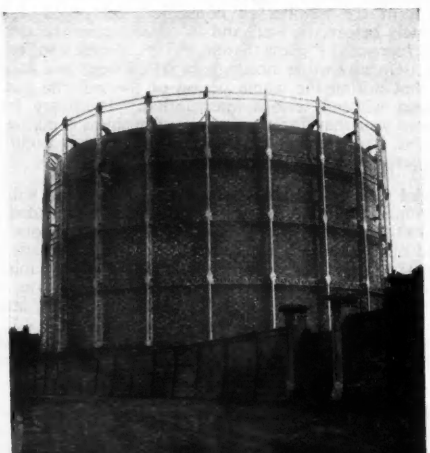

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COMPANY MEETING

Gas Light and Coke Company

Wharncliffe Meeting

A Wharncliffe Meeting of the Proprietors of the Gas Light and Coke Company was held at Gas Industry House on May 2 for the purpose of considering the provisions of the Bill, now before Parliament intituled "An Act to amend enactments relating to the method of charging for gas supplied by the Gas Light and Coke Company; and for other purposes."

Mr. A. E. **Sylvester,** Governor and Managing Director, who presided, said: I declare this meeting to be an extraordinary meeting for the purposes mentioned in the notice relating to such meeting. This meeting of proprietors has been called pursuant to the Standing Orders of Parliament so that you may consider and, if you think fit, approve a Private Bill which has been promoted in order to enable us to make certain changes in the methods of charging for gas. The Directors consider this step to be necessary as part of the scheme for development of the Company's business, and it may be convenient for me to indicate that this development falls under three main headings: first, expenditure upon plant, which is necessary not only to make good the ravages of war, but to provide for the steady increase in business which is anticipated; secondly, improvement on modern lines in conditions of work, in respect of which the National Joint Industrial Council for the Gas Industry has recently taken a considerable step forward; and thirdly, a greater flexibility in our commercial methods, particularly in relation to methods of charge to the domestic consumer. The first two of these I merely mention in passing so as to give some idea of how the Company is responding to the Government's appeal for continuity in development. The third comprises the subject-matter of to-day's meeting, and it is my duty now to explain to you briefly and as clearly as I can why the Directors have promoted this Bill.

As things stand at present, the law is that we must from time to time announce a price of gas, known as "the published price," at which every therm of gas must be sold to all consumers unless a special contract is entered into. It is, however, very clear that the overall cost of supplying gas decreases as larger supplies are taken by the consumer. And now that we are in a position to make reductions in charges to an extent which we estimate to be in the neighbourhood of £700,000 per annum (about 5% of our total revenue from gas), we think it is fairest to our consumers that all who take more than a very small quantity should have the benefit of any price reduction we can offer. I wish to make it quite clear, however, that there is no intention of increasing the price even to the very smallest consumer. This Bill is intended to give us powers to introduce a simple block rate as the normal method of charge to all consumers instead of the flat rate as at present.

In theory there is nothing whatever to prevent our doing this without the authority of Parliament, but it would mean entering into a special contract with every consumer who wished to take advantage of the block rate, and the administrative difficulties of doing this with a million and a half consumers would be enormous. Were we to attempt it, it would probably mean that large numbers of consumers, particularly those who take their supplies through slot meters, might have difficulty in entering into such a contract. The object of the Bill, therefore, is really to ensure that everyone without distinction should be eligible for the benefits of the block rate without the necessity of entering into a contract. At the same time, although this is not covered by the Bill, for we already have powers to do it, we propose to make a special concession to consumers who use slot meters by making a reduction, again on a sliding scale, in the supplement which is charged for the hire of meter and appliances. We feel that this ought not to be charged beyond a certain point, and this means that slot meter consumers will, if our plans go through, receive a double benefit, one from the block rate proposals and the other from the limitation of the supplement.

It is the business of this meeting to consider the Bill in principle, and while I would have liked to give you particulars of the concessions which we have in mind, I am advised that it would be premature to make any announcement at this meeting. I feel, however, that it is necessary to stress one point, namely, that at the present time the Ministry of Fuel and Power has authority to control the price of gas; this safeguard will still remain and will not be affected or weakened by the passing of the Bill.

Finally, since the Bill now submitted to you contains, as you will learn, clauses to amend the basic price provisions of the Company's existing Acts which control the payment of dividends, I should explain that the amendments are purely consequential and that no change is sought in the present system of dividend authorization. The Company's intention is solely to allocate fairly among its consumers the cost of supplying them with gas, and of giving to those entitled to it the benefit of a reduction in price which changed circumstances have made possible. I will now ask the Secretary to read the heads of the Bill.

The Secretary (Mr. **Brian Wood**) said: The object of the Bill is to enable the Company to adopt the block rate system of charging for gas supplied to domestic and other consumers, under which the price per therm charged to consumers for gas supplied is not uniform, but is graded according to the several quantities which they consume in any given period, and the Preamble of the Bill explains that the necessity for further legislation arises from the fact that the Company, having published, pursuant to Section 6 of the Gas Undertakings Act, 1934, the price per therm at which they are prepared to supply gas, are obliged by that section to charge that price, neither more nor less, for every therm which they supply otherwise than under a special contract.

Clause 1 states the title of the intended Act.

Clause 2 contains definitions of various expressions used in the Bill.

Clause 3 authorizes the Company to adopt the block rate system, and continues the existing enactments under which the Company are empowered or required to charge for gas supplied in certain parts of their area of supply higher prices per therm than are for the time being charged in other parts of that area.

Clause 4 requires the Company, before exercising the powers of Clause 3, to give to the local authorities of all districts within the limits of supply notice of the scale of quantities and prices in accordance with which they are prepared to supply gas (otherwise than under a special contract) in the several parts of the limits. The clause enables the Company from time to time to vary the scale of quantities and prices, on giving notice to the local authorities. The clause applies the appropriate provisions of section 6 of the Gas Undertakings Act, 1934, but excludes the provision in that section which requires the same price to be charged for every therm supplied.

Clause 5 makes the necessary adaptation of the existing enactments relating to differential prices by substituting references to the several prices per therm charged in accordance with the published scale for the references in those enactments to the price per therm charged under the existing flat rate system.

Clause 6 modifies in certain respects the provisions of Part III of the Company's Act of 1931, under which the dividends which the Company may pay on their ordinary capital are regulated by what is known as the basic price and dividend system. That system will continue to apply, but certain adaptations are necessary in order to make it fit in with the proposed new system of charging.

Clause 7 saves the Company's right to enter into special contracts, that is to say contracts for the supply of gas for industrial or other purposes at a price per therm different from the published price or scale of prices.

Clause 8 leaves it optional to the Company to continue the existing system of charging until they decide to adopt the block rate system and, after having adopted the block rate system, to revert, either permanently or temporarily, to the existing system. It is considered desirable that the Company should have this option in order to enable them to meet changing circumstances by applying whichever system is the most suitable for the time being.

Clause 9 provides in the usual way for the payment by the Company of the costs of obtaining the proposed Act, which may be defrayed wholly or partly out of revenue.

The Governor then moved: "That the Bill now submitted intituled 'An Act to amend enactments relating to the method of charging for gas supplied by the Gas Light and Coke Company; and for other purposes' be, and the same is hereby approved subject to such alterations and variations as may be made in the Bill by Parliament and approved of by the Directors."

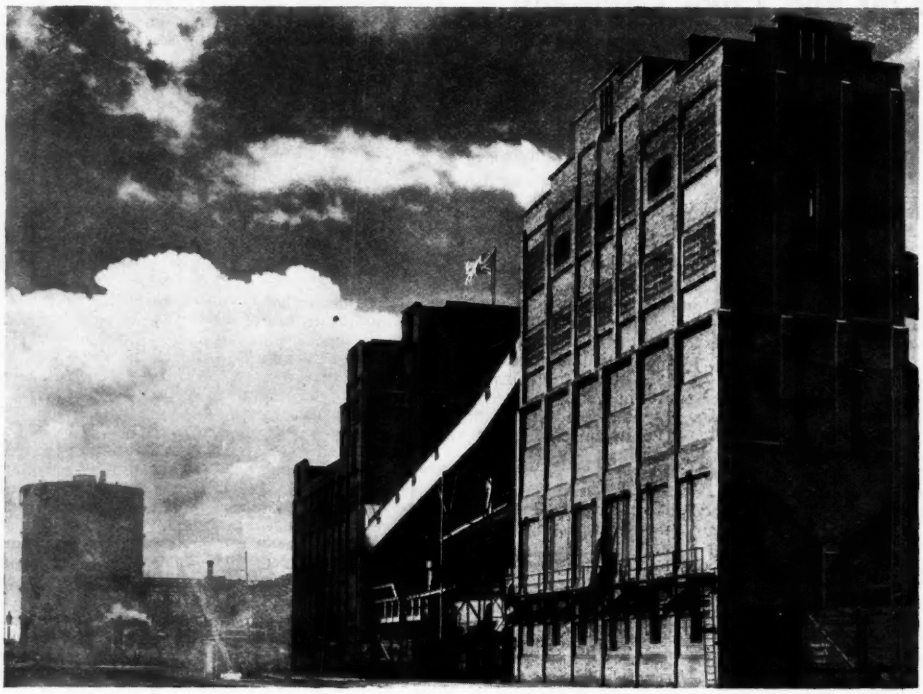
Lord Mersey seconded the resolution. The Governor invited questions, but there was no comment, and the Bill, subject to alteration by Parliament, was approved by the proprietors.

Southern Association (Eastern District)

At a meeting of the Southern Association of Gas Engineers and Managers (Eastern District) at Gas Industry House on April 26, Mr. J. H. Dyde (Uxbridge and Slough) was elected Chairman for the ensuing year in succession to Mr. G. L. Braidwood, with Mr. H. J. Escreet (Gas Light and Coke Company) as Vice-Chairman.

The Chairman (Mr. Braidwood) recalled that steps had been taken to introduce a new and more democratic method of electing members of the Committee. The Rules Sub-Committee had completed its task, having completely redrafted the rules, which were subject to the approval of the main Association. Until the revised rules became operative the old arrangements would have to be followed, and he therefore asked the meeting to approve of the following nominations made by the Committee:

Committee: C. A. Deas, W. K. Tate, T. C. Battersby, H. Moys, C. T. Price, J. W. Townsend, N. Willsmer, Lt.-Col. J. A. Gould, A. H. Andrews, D. B. Parkinson, G. H. Kenyon, Dr. S. Pexton, W. A. Barnett, Dr. A. E. Haffner, S. W. Hammond, with the President and Vice-President of the main Association. *Hon. Secretary*: J. M. Webber. *Representatives to the General Committee*: C. A. Deas, W. K. Tate, T. C. Battersby, H. Moys, J. W. Townsend, N. Willsmer, Lt.-Col. J. A. Gould, and G. H. Kenyon. *Representatives on District Education Committee*: G. L. Braidwood, J. H. Dyde, Lt.-Col. J. A. Gould, and G. H. Kenyon.



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COMMUNICATION No. 230—PROCEEDINGS OF THE INSTITUTION OF GAS ENGINEERS, 1939-40.

In this photograph of the fourth Installation of Glover-West Vertical Retorts at the Foleshill Works, Coventry, the coke storage hoppers with screening plant above are seen in the foreground. The retort house lies to the left. Space between is reserved for the duplication of the carbonizing plant. The project for the complete installation is sketched below.

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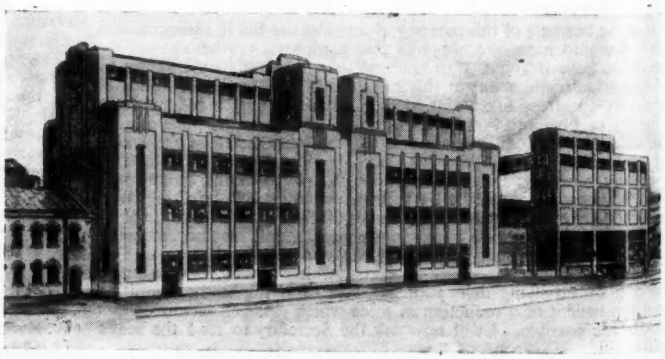

GAS PRODUCTS PRICES—STOCKS AND SHARES

The London Market May 6.

There are no changes to report in the prices of Coal Tar products, the majority of which are controlled either by Government Order or by agreements.

The following are controlled by Government Orders at the prices indicated:—

Road tar at 5½d. per gallon filled into buyers' tanks at sellers' works, with corresponding prices when delivered and when supplied in packages.

The price sprayed direct on to roads is controlled by agreement and is 8½d. per gallon for full tank loads in London and adjacent counties.

Creosote for hydrogenation is based on 5.875d. per gallon and creosote for timber preservation on 5½d. per gallon *ex* sellers' works, with the usual extras for different qualities, packages, &c.

The basic price for cresylic acid is 3s. 6d. to 5s. per gallon, according to grade.

Hot pressed naphthalene costs £11 11s. in bulk *ex* distillers' works. Prices for refined naphthalene vary from £20 15s. per ton for crystal on 50-ton contracts to £26 15s. per ton for ball and flake. These prices are delivered England and Wales in 2-cwt. bags, minimum 4-ton lots.

The maximum prices for coal tar naphtha vary from 1s. 11d. to 2s. 11d. per gallon and for xylol from 3s. 3½d. to 3s. 6d. per gallon delivered buyers' address in minimum 1,000-gallon lots in bulk. The maximum price for pure toluene is 3s. 2½d. per gallon in bulk *ex* sellers' works.

The following prices are controlled by agreements:—

Pitch for briquetting is 70s. per ton *ex* sellers' works in bulk.

Phenol is 9½d. to 11½d. per lb. in large returnable drums delivered buyers' address, according to quantity.

The Provinces May 6.

The average prices of gas-works products during the week were: Pitch, 70s. per ton; toluole, naked, North, 90's, 2s. 4d. to 2s. 6½d. per gallon; pure, 3s. 2½d. Prices for carbolic acid 60's, anthracene, creosote oil (hydrogenation), coal tar oils (timber preservation, &c.), and strained anthracene oil are controlled by S. R. & O. 1943, 1538, and for naphthalene by S. R. & O. 1944, 1051. Prices for road tar were increased by a half-penny per gallon by S. R. & O. 1945, 229, under which Order there was also an increase of 5s. per ton in the price for standard creosote-pitch mixture.

The bulk of the pitch produced in this country is required for home trade purposes, but certain quantities are being sent at higher prices to Allied countries with the approval of the Coal Tar Control. So far as creosote is concerned the bulk is required for essential purposes, at controlled prices. With regard to hydrocarbon oils, the prices remain fixed, although there is more freedom than was previously the case.

Scotland May 4.

Home business is steady and a fair volume is being placed for export. Refined tar*: Yield to the Distillers is 5d. per gallon *ex* Works, naked. Creosote oil: Timber preserving quality,* 5½d. to 6½d. Hydrogenation oil,* 5⅞d.; low gravity or virgin oil,† 7½d. to 7½d.; benzole absorbing oil,* 6½d. to 8d. per gallon. Refined cresylic acid* is 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha†: 7d. to 8d. per gallon. Solvent naphtha*: Basic maximum prices delivered in bulk, 90/160 grade, 2s. 10d., and 90/190 Heavy naphtha, Unrectified, 2s. 0½d.; Rectified, 2s. 4d. per gallon. Pyridine†: 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

* Price controlled. † Uncontrolled.

The week opened with a new high record for the number of bargains marked, but despite this the general trend was downwards by reason of profit-taking. Later in the week this movement eased up and there were a few firm features. British Funds hardened and brewery shares showed a good recovery, but on the whole markets were checked by the uncertainties with regard to the U.S. Loan.

There was a fair turnover among gas stocks and shares, and the majority of quotations remained unchanged. It will be seen below that a few fixed-interest] stocks closed a few points higher. Imperial Continental was inclined to react until the dividend announcement on Friday, when the price advanced 2½ points. The Directors are recommending a dividend of 5% and a special dividend of 3% for the year to March 31 last (against 3¾% and 6¼% respectively for 1944–45).

The following were the few price changes up to and including Thursday last:

PROVINCIAL EXCHANGES

Bath Cons.	113—115	+1	
Hartlepool Ord.	101—103	+1½	
Newcastle 4 p.c. Red. Deb. (*x.d.*) ..	102—104	April 29	

OFFICIAL LIST

Commercial 5 p.c. Deb.	115—120	+2
Gas Light 3 p.c. Deb....	92½—95½	+½
Imperial Continental Ord.	122—127	—1
Liverpool Ord.	114—117	+1
Montevideo Ord. (*x.d.*) ...	115—120	April 29
Primitiva Holdings, Ltd., Ord. ...	12/—13/—	—/6d.
Severn Valley 4½ p.c. Cum. Pref. ...	21/—23/—	+1/—
South Metropolitan 4 p.c. Pref. ...	100—103	+1½
Ditto 3 p.c. Deb.	90—94	+2½
United Kingdom Gas Corporation Ord.	20/3—21/3	—/3d.

SUPPLEMENTARY LIST

Tunbridge Wells Sliding Scale (*x.d.*)	137—142	April 29

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